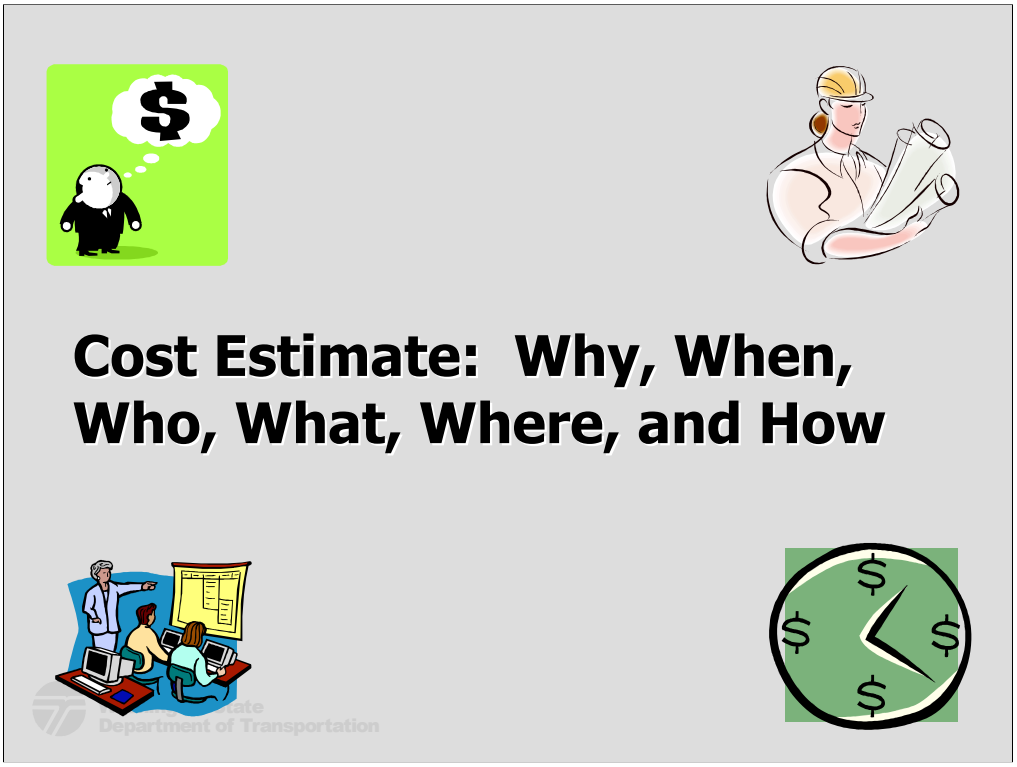
NORTHWEST REGION
DESIGN & CONSTRUCTION CONFERENCE
2007

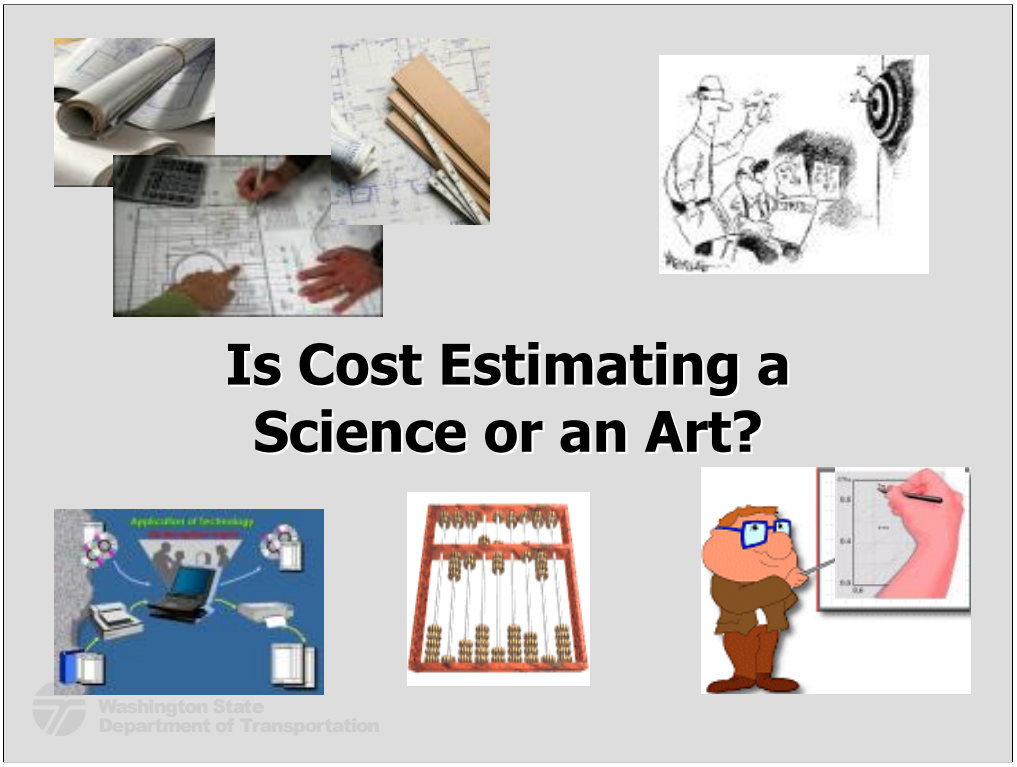
Project Cost Estimating

Risk Based Estimating

Tuesday Feb 27 & Wednesday FEB 28
Hamlin Room 10:30 am to 11:30 am

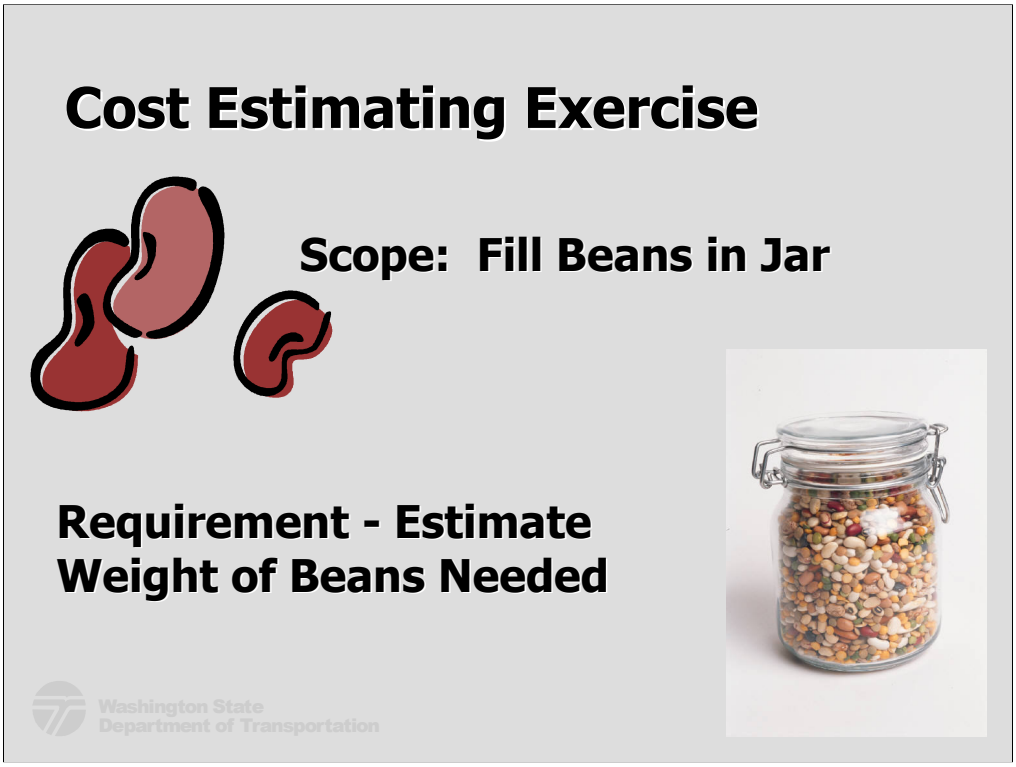


This session will focus on several issues related to cost estimating. For example, we will discuss **why** we do cost estimates and **why** they are important. We will discuss **when** we prepare estimates in terms of the WSDOT project development process. This discussion will also relate cost estimating to the WSDOT Project Management Process. We will also discuss **what** are the main issues and challenges related to preparing cost estimates. Because estimating is a multi-disciplinary effort, **who** prepares cost estimates is discussed. Cost estimates are prepared in many locations, thus, **where** they are preformed is important. Finally, we will explore **how** estimates are prepared.



Let us discuss this question for a few minutes.

This is an interesting question. Most of you are planners or design personnel where your main project responsibilities are related to preparing technical information such as traffic operations analysis, concept drawings, preliminary plans and specifications. In the cost estimating field you use this information to prepare estimates. You have to interpret technical information and often make calculations to develop quantities of material for different items of work. This, perhaps, is the science involved in cost estimating. What then is the art in cost estimating? I would say the art is, for example, having the skill to conceptualize a work component, relate the construction of this component to the site conditions and then apply a unit price that reflects site conditions as well as current market conditions.



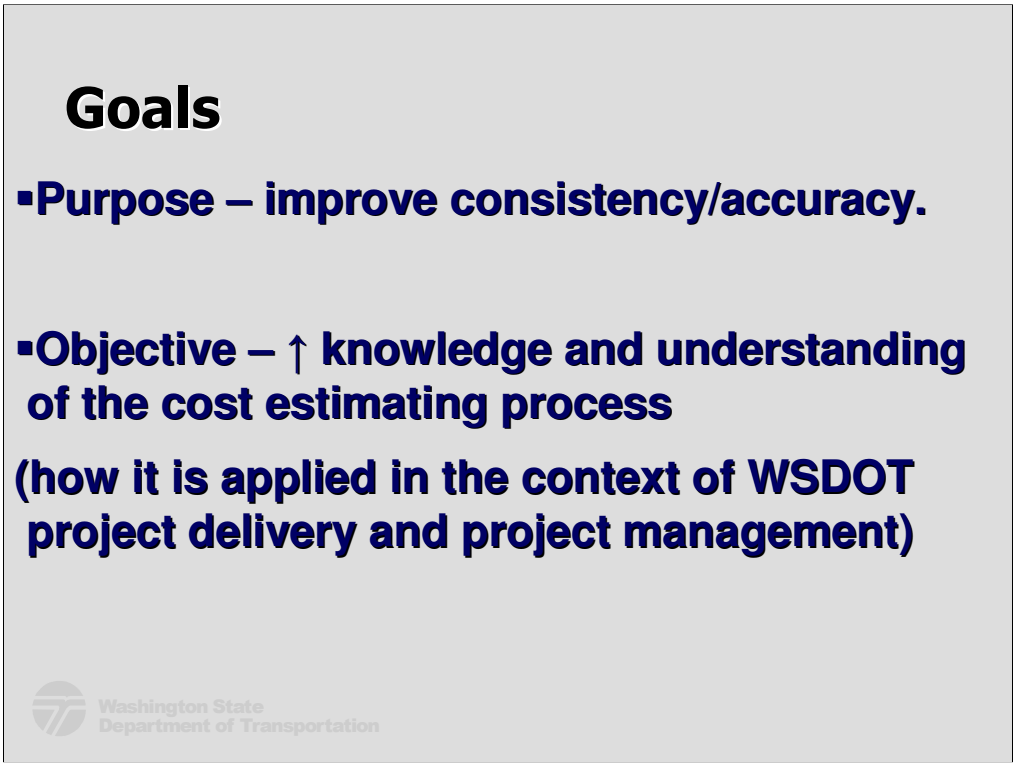
Prepare an estimate. Your scope of work is to fill this jar with pinto beans. You have some experience with pinto beans as you have a few of them.

Estimate the weight of the beans and the appropriate unit price; then the highest reasonable weight, THEN you will estimate the most likely weight of beans in the jar. You should record your estimate methodology.

Think of this as the 80% area under the bell curve, that is, the normal distribution (draw a picture of a bell curve on the board labeling the low, most likely, and high numbers, if necessary). Ask yourself, what is the probability of the actual weight of beans within your range? Record your answer. Use whatever tools you have to prepare your estimate.

Note: After this is completed ask each participant to provide their estimate starting with the most likely. Write this on the board and discuss the results. Repeat this with the ranges. Write down and discuss the results. Ask them how they developed their estimate, that is, what methodology did they use.

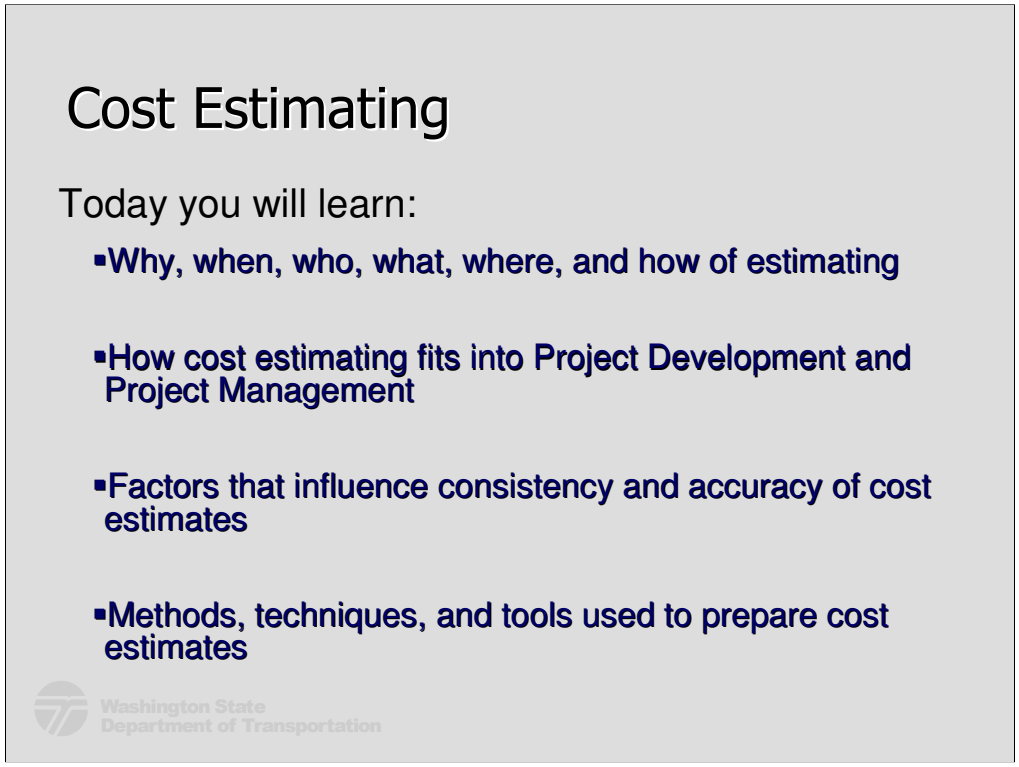
Reflect for a minute on how this exercise applies to cost estimating. Thoughts – use different methods based on level of information; the estimate ranges tighten when more information is available to estimate the number of beans; we tend to estimate on the low side; there is uncertainty in every estimate; the beans are the same but what if you had a mix of different beans how would this impact your estimate; and time to prepare an estimate impacts accuracy.



The purpose of the course really relates to improving consistency and accuracy of cost estimates regardless of when they are prepared in the planning and project development process.

We want you to better understand the cost estimate process and how this process is applied on WSDOT projects.

Suggested courses on estimating include: *Introduction to Project Development* (Course Code CF4), *Design Documentation* (Course Code BZ8) and *Project Management Process* (Course Code B71). This course will not cover cost estimating at the end of PS&E to prepare an Engineer's Estimate. This topic is covered under the *Contract Plans, Provisions, and Estimate Preparation* course (Course Code A4J). *Risk Based Transportation Cost Estimating* (Course Code CZ2)



There are five learning objectives for this session. The first three objectives focus on background information while the last two objectives really cover the “heart” of the session.

WHY

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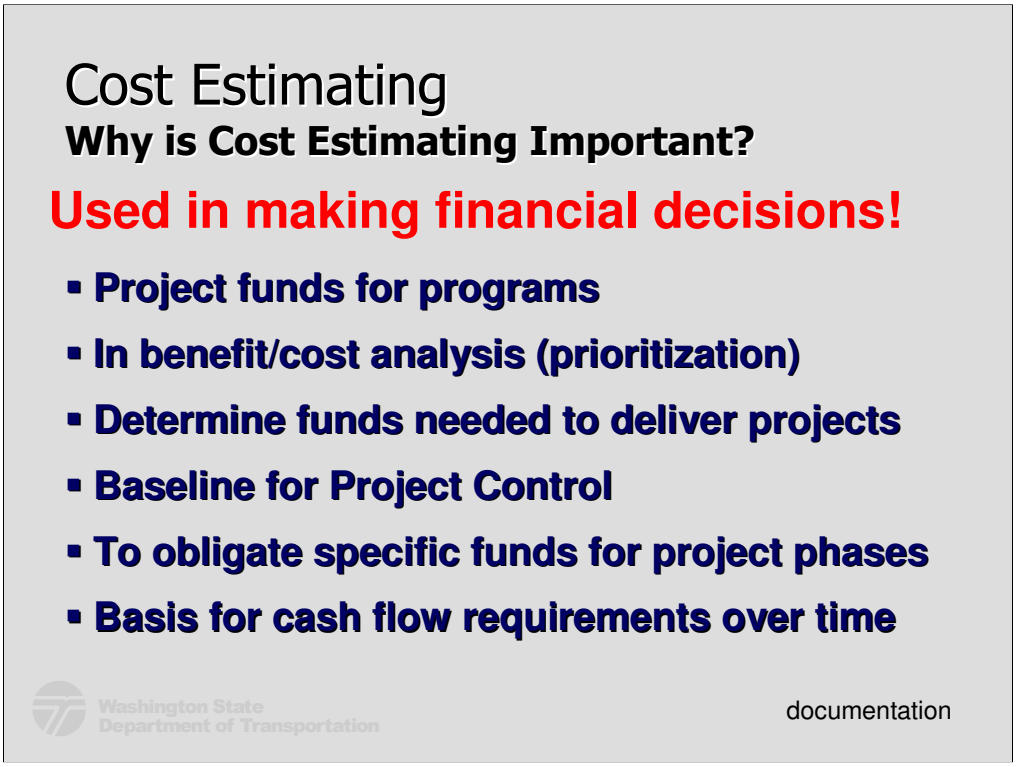

What types of financial decisions are made based on cost estimates?

WSDOT has a series of programs to address needs and deficiencies. These programs cost money. Cost estimates determine how much money is needed over some period of time to support key programs such as the Highway System Plan, Capital Improvement and Preservation Program, and the Biennial Program. Someone has to decide what projects have priority. WSDOT does not have sufficient funds to design and construction every project that is needed. Cost estimates can be used in benefit cost analyses to prioritize a list of projects within a program. Eventually, a cost estimate has to be prepared for a specific project. At some point in the project development time line this project cost estimate will become the baseline budget used to control the funds allocated to the project. Cost estimates are used to obligate funds such as for the biennial budget or for construction at bid. Finally, Program Management needs to know when the funds are needed so when an estimate is combined with a schedule a project cash flow or "aging curve" is prepared.

Finally the voters make financial decisions based on estimates…. Some projects are subject to advisory votes.

WHEN

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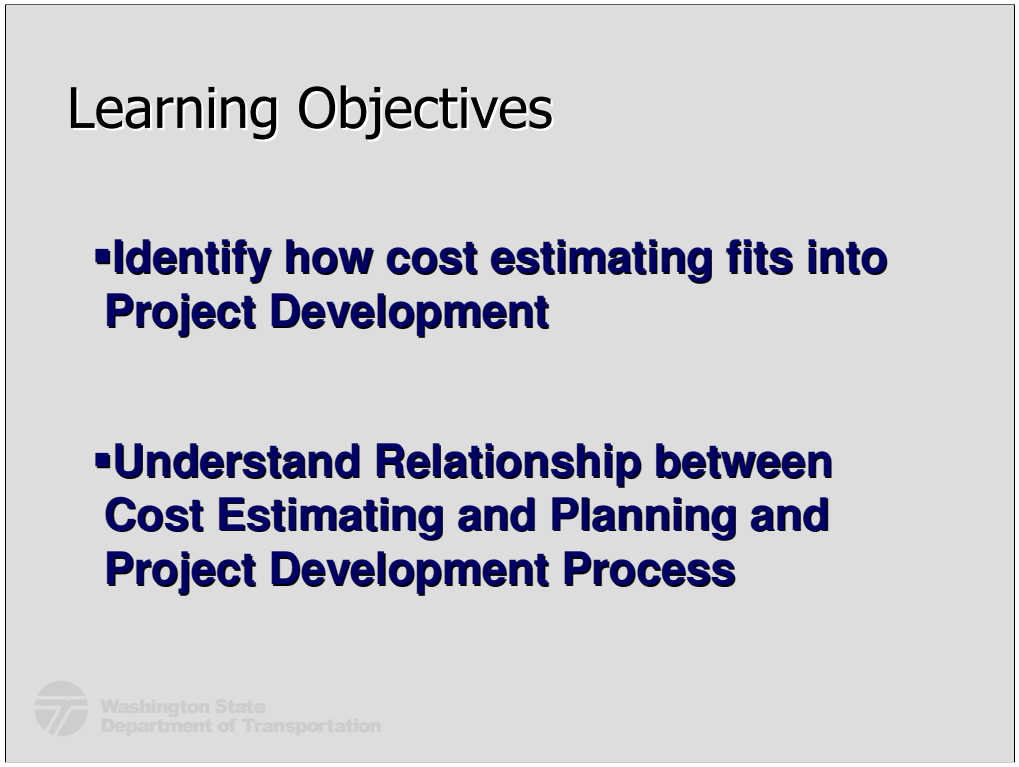


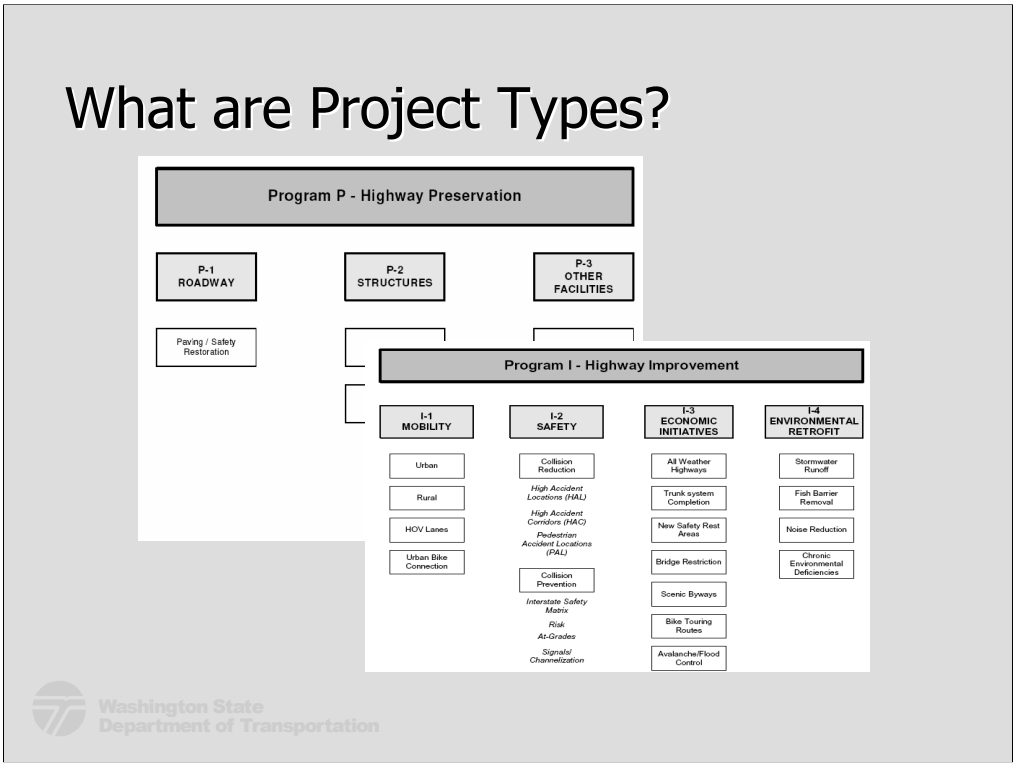
WHEN Learning Objectives

The specific learning objectives for this Module are:

- Review the planning and project development process from concept to completion of a project
- Understand how cost estimating fits into this process

Why do we want to do this? Some points are:

- Cost estimates serve different purposes at different points in project development
- While the cost estimating process follows the same steps, the inputs and outputs change over time
- Scope definition matures as the project is developed. This affects cost estimating techniques and tools that are used.

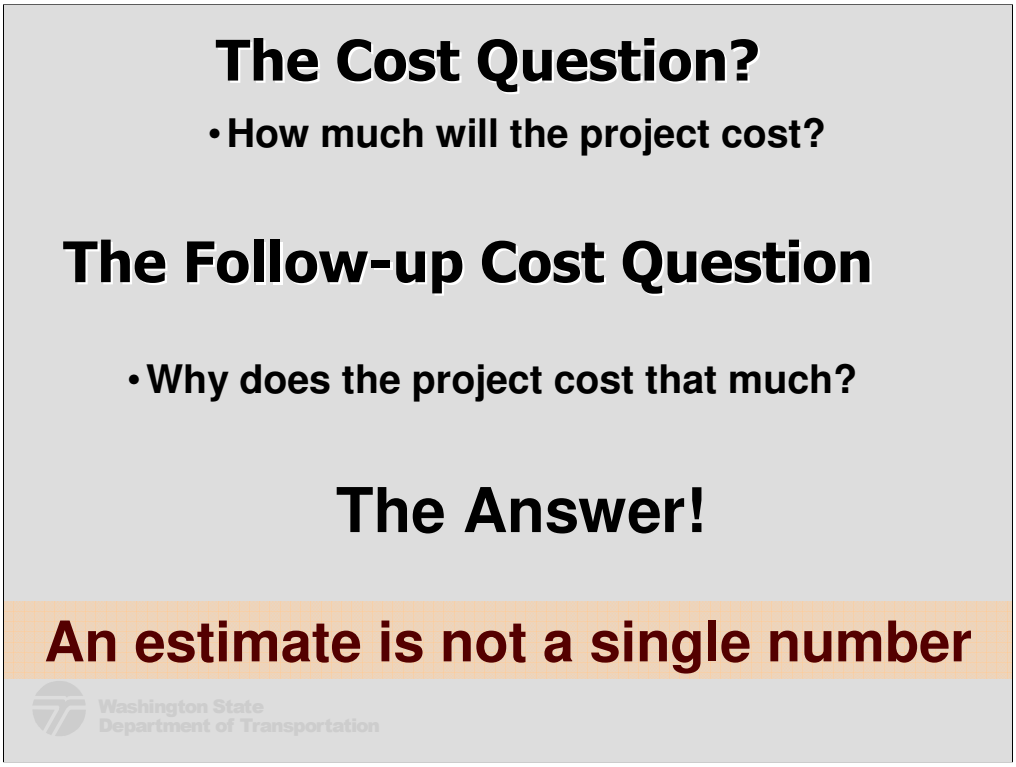


PROJECT TYPES - PRESERVATION

Projects in WSDOT programs are categorized as Preservation and Improvement. Preservation projects tend to be less complex and perhaps less difficult to estimate.

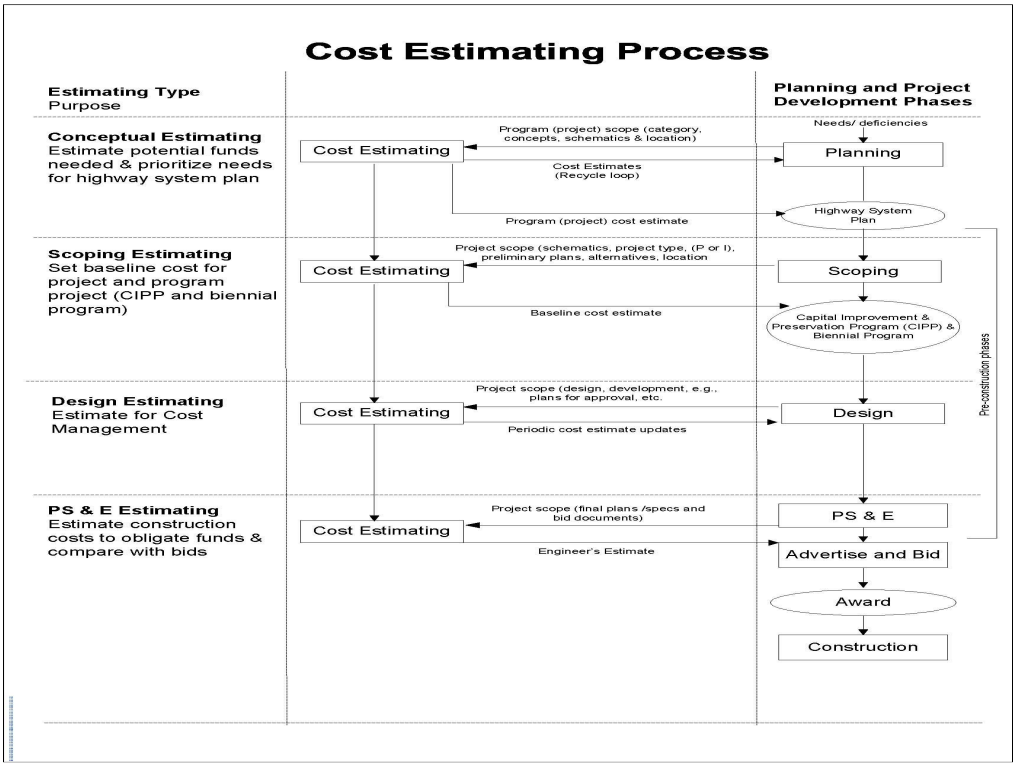
PROJECT TYPES - Improvement Projects

The type of projects under the improvement category tend to be more complex and perhaps more difficult to estimate.



Key Cost Question

The answer to the cost question and cost follow up question is that estimates are prepared at different times during project development. Different stakeholders or entities may be asking these questions. For example, a legislator could ask these two questions for a project within their region and very early prior to when the project is programmed. Alternatively, the public may be asking either one of these questions but more likely the second question regarding why a project cost so much. Regional Management and HQ management are likely to ask these same questions to understand and be able to explain the costs for a project. A systematic estimating process employed at the right time during project development can help provide the answers. The answers are not single numbers but rather a range of numbers.



Interaction between Cost Estimating Process and the Project Development Process

Overall interaction between the planning and project development phases on the left hand side and cost estimating in the middle of the slide. The basic purpose behind the development of the cost estimate that supports each phase is shown on the left hand side of the slide.

More information about the planning and project development process can be found in the course *Introduction to Project Development* (Course Code CF4).

Cost Estimating and Planning *(Conceptual estimating)*

Where needs and deficiencies are converted into a set of projects that are ultimately be incorporated into the Highway System Plan. The Highway System Plan (HSP) is a plan that covers a 20 year period of potential projects. In order to prioritize and determine funds required to support the HSP, cost estimates are prepared. A basic input for these cost estimates is the scope definition or description of projects developed throughout the Planning phase. This scope definition is very limited at this point and may include concepts, schematic drawings, and boundary locations. Larger or mega projects may require more complete scope definition is order to estimate them.

Cost Estimating and Scoping *(Scoping Estimates)*

Where the basic scope is developed for a specific project that will be incorporated into the Capital Improvement and Preservation Program (CIPP) and/or the Biennial Program. The CIPP is a program that covers a six to ten year period of projects. The Biennial Program is the two year program that forms **The Book** of projects that is approved by the Legislature. In order to prioritize and determine funds required for these two programs, cost estimates are prepared. Key input for these cost estimates is the project scope, which is described in terms of preliminary plans, different alternatives, site characteristics, and other related project information. This information is developed through the Scoping process. The output of Scoping is a Project Summary. This summary has three parts – Project Definition, Design Decisions Summary, and Environmental Classification Summary. Backup support for the Project Summary can be very limited at this point for less complex projects such as pavers or much more detailed for complex mobility projects. At the end of the Scoping phase the design for a project could be anywhere between five and 25 percent complete.

Cost Estimating and Design *(Design Estimates)*

Where a specific project is designed with the intent of preparing final plans and specifications to support PS&E. The project scope, budget, and schedule for design and construction letting is included in the Capital Improvement and Preservation Program and/or the Biennial Program. As the design is prepared there is a need to develop periodic estimates. Key input for these cost estimates is plans for approval, and other relevant design documentation, that is developed throughout the Design phase. This scope definition is increasingly more defined as Design progresses. Changes in cost are documented on a Project Control Form.

Cost Estimating and PS&E *(Engineer's Estimate just prior to AD)*

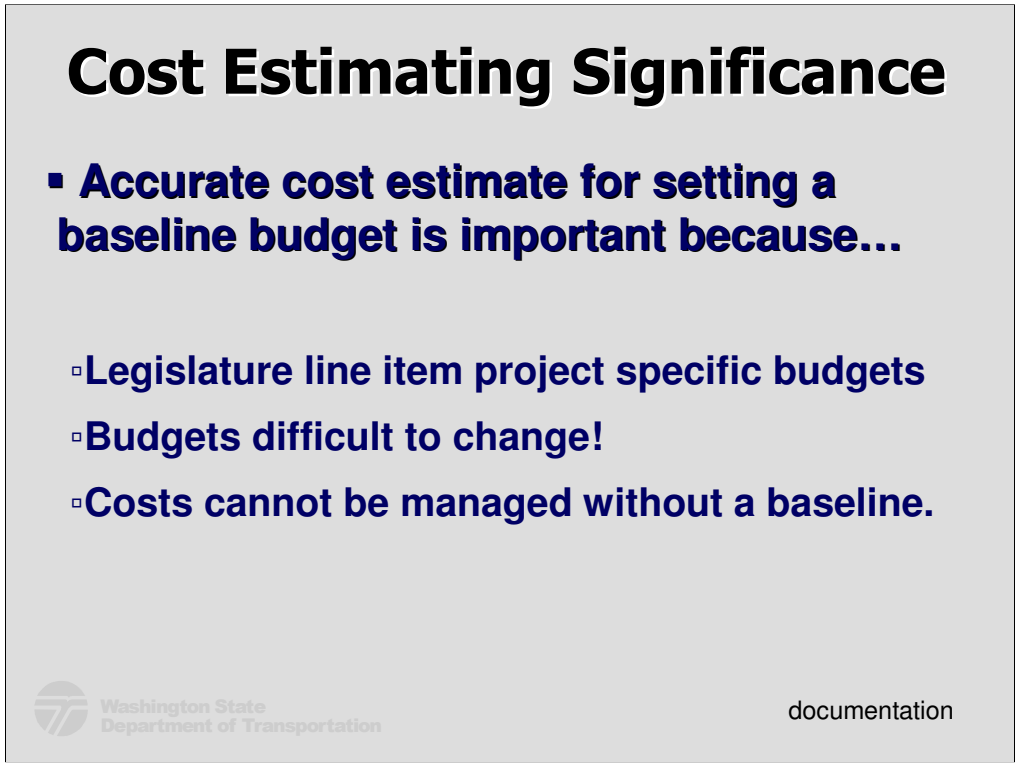
Where final plans, specifications, and bid documents are prepared so a project can be Advertised and Bid for construction. Scope is completely defined at this point in project development as plans and specifications are 100 percent complete.

PS&E estimating process as is covered under the *Contract Plans, Provisions, and Estimate Preparation* course (Course Code A4J).

Development Phase	Purpose
Planning	▪ Highway System Plan (HSP) ▪ Prioritization (B/C Analyses) ▪ Long-range Funding Levels
Scoping	▪ CIPP ▪ Set Baseline ▪ Program Projects
Design	▪ Project Delivery ▪ Cost Management
P S & E	▪ Obligate Funds ▪ Compare to Contractor Bid

Purpose of Cost Estimating and Each Project Development Phase

This table summarizes the main purposes of cost estimates as prepared in each of the four major development phases.



Cost Estimating Significance

Another significant cost estimating issue is line item budgets approved by the Legislature. Line item budgets started with the Nickel gas tax. This budgeting approach continues with the 9.5 cent gas tax upheld in November 2005. It is likely to continue in the future. A line item budget substantially increases the importance of preparing accurate baseline cost estimates to support project budgets. This approach also places greater emphasis on project management and, in particular, Managing Scope, Schedule, and Budget and Managing Risks.

WHO

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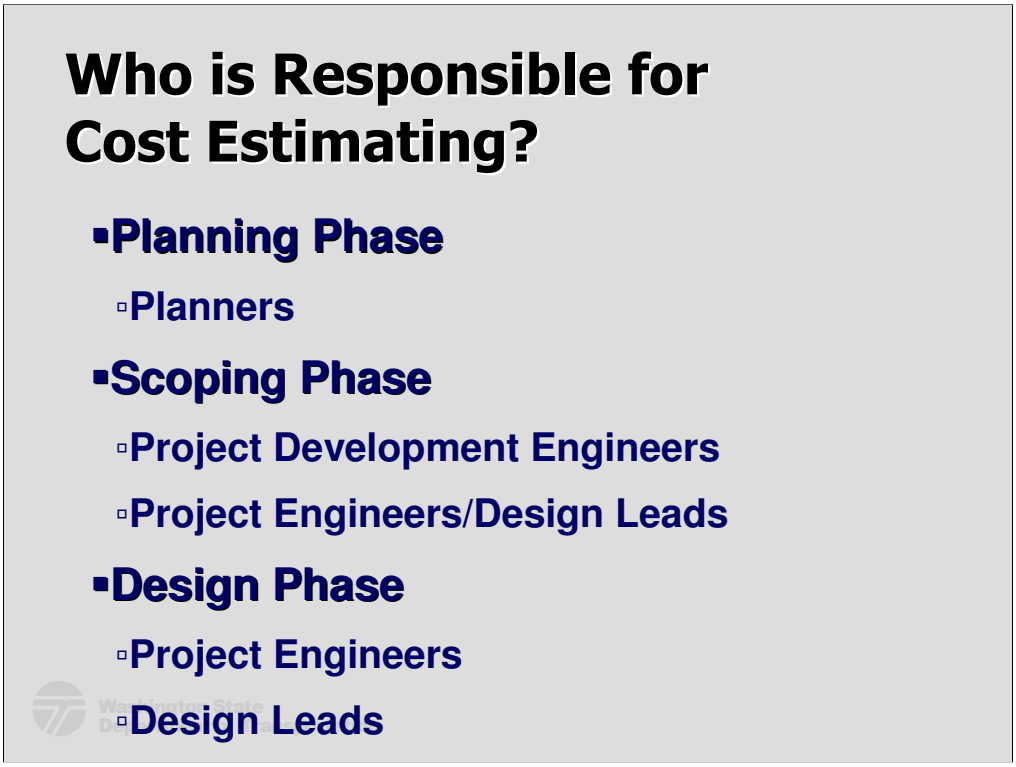
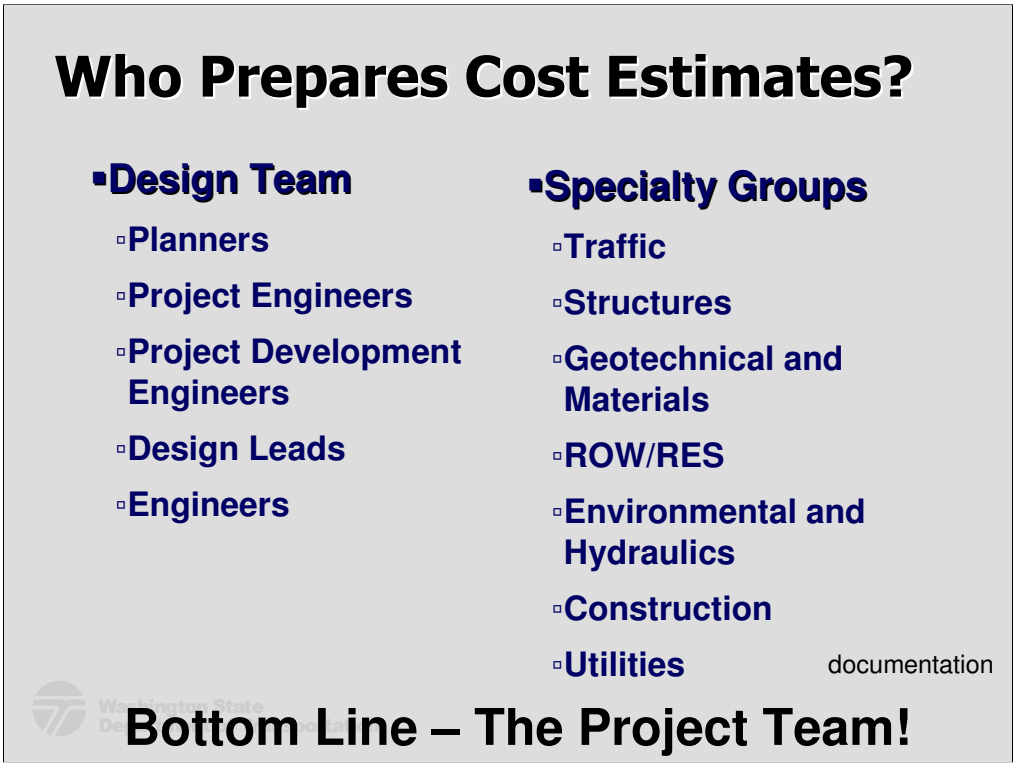


Estimate Responsibility

Responsibility for the Cost Estimating process changes as the project matures from planning to design. These changes are related to the planning and project development phase in which an estimate is being prepared.



Estimate Preparation

This Slide identifies some specific individuals who prepare cost estimates. Note that both design team members and different specialty groups prepare cost estimates. Thus, this effort is truly multi-disciplinary. However, the more personnel involved in cost estimating, perhaps, the more difficult the effort becomes with respect to coordinating the input of all individuals involved and ensuring that the project scope is accounted for in the based cost estimate.

Who are the Specialty Groups (Internal)? – WSDOT offices that specialize in disciplines that support project development. For example, Bridge, Communications, Environmental, Geotechnical, Hydraulics, Landscape, Materials, Program Management, Real Estate Services, Right of Way, Traffic, Utilities, and Work Zone Traffic Control are all internal specialty groups. More specific information about these groups and others can be found at:

URL - http://www.wsdot.wa.gov/Projects/ProjectMgmt/OnLine_Guide/Phase_Guides/Pre-Construction/PC_Initiate_Align/PC_Team_Responsibilities.htm

Ultimately, responsibility for cost estimating requires a team effort!

WHAT

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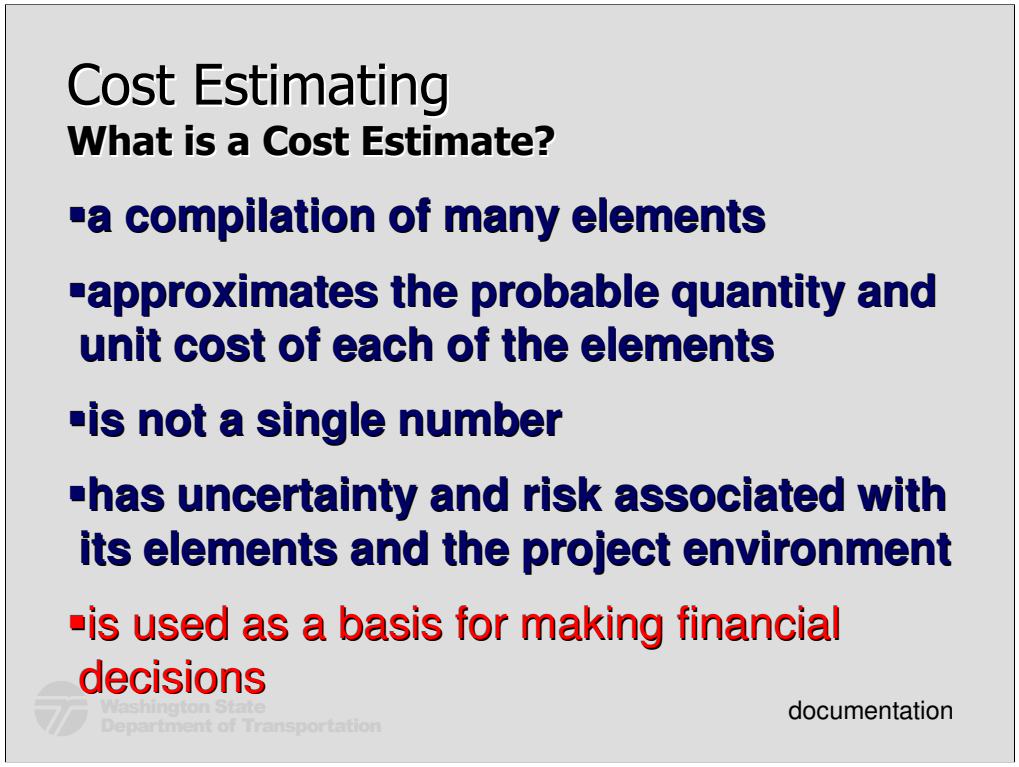

Some key answers to the question, “What is a Cost Estimate?” include that an estimate is made up of many elements. However, the elements may not be completely defined at the time the estimated is prepared. A cost estimate is only an **approximation** of the **probable cost** of these elements. There is uncertainty associated with any estimate. There are unknowns that may not be understood. Remember then that an estimate is not a single number but more likely a range of numbers. Finally, a cost estimate is used to make financial decisions regarding a specific project or groups of projects also known as a program.

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Cost Estimating

Where is Cost Estimating Performed?

- At your desk and in the field.
- With your specialty groups.
- On the phone and on the computer.
- Wherever you gather information and document project items in terms of quantity and cost.

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documentation

Where do you begin your project quantification? THROUGH RESEARCH and IN THE FIELD.

HOW

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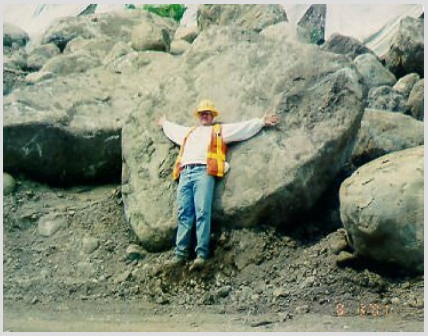
Unforeseen Conditions
Internal and External

- Unknown soil conditions
- Unknown utility locations
- Extent of ROW required
- Others???

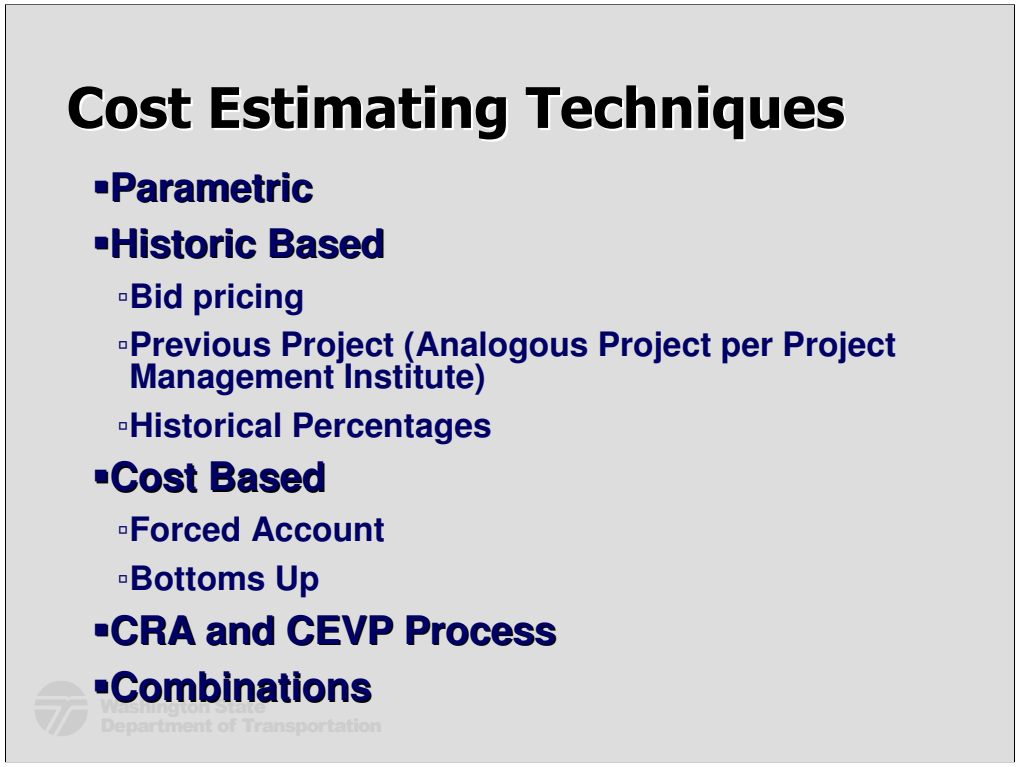


What are Unforeseen Conditions?

Unforeseen conditions are notorious for causing project cost overruns. Unknown soil conditions can effect excavation, compaction, and structure foundations. Contaminated soils may be present resulting in the need for special mitigation work. Utilities are often present that are not described or described incorrectly on existing drawings. There are a multitude of problems that are simply unknown during the early project phases and which can increase project cost when they become apparent during construction (from NCHRP Project 8-49 Guidebook).

What are issues related to Unforeseen Conditions?

A sound approach to estimating unforeseen conditions is to thoroughly document estimate basis and assumptions especially in areas such as soil conditions, utility locations and right-of-way required. When the railroad is impacted by the project, assumptions related to the cost impact of working with the railroad companies should be clearly stated in the estimator's back up. Further, a risk analysis should attempt to quantify the impact if there is reason to believe that unforeseen conditions may be problematic in a certain area of the project.



Parametric Estimating

Parametric estimating is primarily used to support development of planning level estimates where very little project scope definition is available. Major project parameters are identified. Statistical relationships and/or non-statistically based ratios between historical cost data and key project parameters are used to calculate the cost of various items of work (e.g., tons of asphalt, square foot of bridge deck).

Bid-Based Estimating

The use of historical data from recently bid contracts is the most common WSDOT estimating approach. Under this approach, bid data are summarized and adjusted for project conditions (i.e., project location, size, quantities, etc.) and the general market conditions. Line items are developed for major elements of work so that quantities and historical unit prices can be applied to these line items.

Previous Project (Analogous) Estimating

An estimating technique that uses the values of parameters, such as scope, cost, budget, and duration or measures of scale such as size, weight, and complexity from a previous, similar activity as the basis for estimating the parameter or measure for a future activity. It is frequently used to estimate a parameter when there is a limited amount of detailed information about the project (e.g., in the early phases). Analogous estimating is a form of expert judgment. Analogous estimating is most reliable when previous activities are similar in fact and not just in appearance, and the project team members preparing the estimates have the needed expertise.

Historical Percentages

This technique is used to estimate costs for items that are not defined. A percent is developed based on historical cost information from past projects to cover certain items. This percentage is based on a relationship between the items and a total cost category such as direct construction. Mobilization, Construction Engineering, and Preliminary engineering is often estimated based on a percent of construction.

Cost Based Estimating

This technique relies on a bottoms up approach to estimating wherein construction costs are estimated for labor and equipment based on estimated production rates, materials, contractor overhead, and contractor profit for each major line item. This means that labor and construction equipment resources are specifically identified for each element and tied to time–production–when these resources will be engaged on a construction operation. Estimates of preliminary engineering and construction engineering can be estimated from the bottom up based on for example, full time equivalent personnel and the time these personnel will be involved in the design or construction.

Cost Estimating Tools

- Cost per Mile
- Standard Item Table
- Spreadsheets
- EBASE
- Databases – Unit Bid Analysis, bidTabs Pro, Bid Ad and Award Data, RS Means
- Independent Investigation
- Cost Indices
- Risk Analysis with probabilities and simulation
- Internal and External Reviews
- Project Cost Estimate File

Tools

Techniques and Tools Matrix

Technique / Tool	Parametric	Historical Based			Cost Based	CRA/CEVP
		Bid Pricing	Previous Project	Historical Percentages		
Cost Per Mile	√					
Standard Item Table		√	√	√		
Spreadsheets		√	√	√	√	
Ebase		√				
Unit Bid Analysis		√	√	√		
BidTabs Pro		√				
Ad and Award Date		√			√	
RS Means					√	
IndependentInvestigation		√			√	
Cost Indices						√
Risk Analysis						
Internal/External	√	√	√	√	√	√
Received						
Project Cost Estimate	√	√	√	√	√	√
File						

documentation

RESOURCES

There are many resources for cost estimating, including the following websites:

CREM OFFICE WEBSITE (CRA & CEVP)

http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/

(the cost estimate process can be found at this location)

NUMEROUS RESOURCES AT:

http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/workshop.htm

Such as: Project Estimate Basis Form, CRA/CEVP Workshop Request Form, Guidelines and other info.

PROJECT MANAGEMENT WEBSITE:

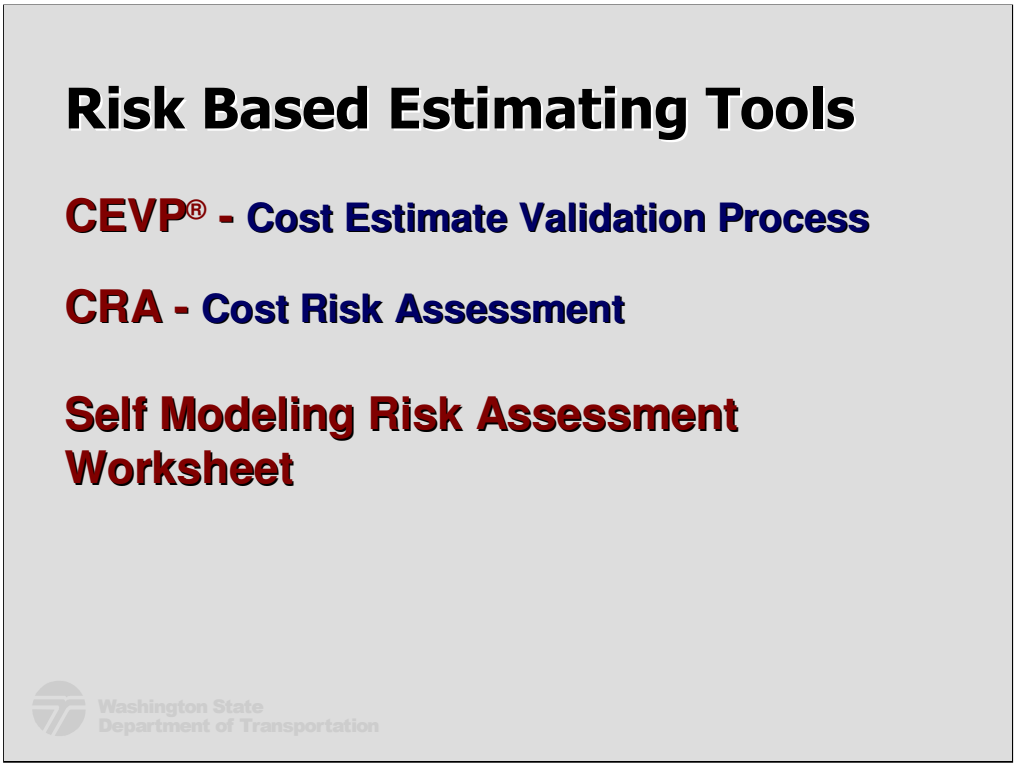
http://www.wsdot.wa.gov/Projects/ProjectMgmt/OnLine_Guide/Phase_Guides/Pre-Construction/Pre-Construction_files/slide0001.htm

STATE CONSTRUCTION OFFICE:

http://wwwi.wsdot.wa.gov/eesc/cons/

FERRY SYSTEMS COST ESTIMATING INFO:

http://wwwi.wsdot.wa.gov/ferries/TerminalEngineering/CostEstimating.htm



What is CEVP®?

CEVP® is an intense workshop in which a team of top engineers and risk managers from local and national private firms and public agencies examine a transportation project and review project details with WSDOT engineers.

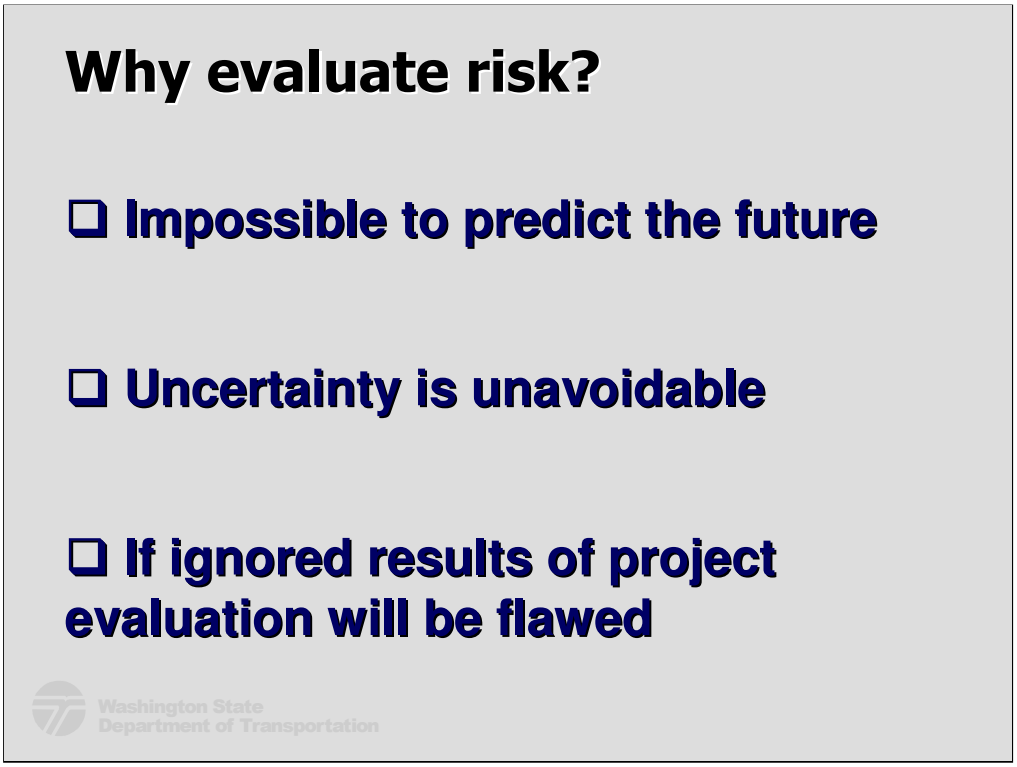
The CEVP® workshop team uses systematic project review and risk assessment methods to identify and describe cost and schedule risks.

What is CRA?

Cost Risk Assessment (CRA) is a term that describes a workshop process similar but less intense than the Cost Estimate Validation Process (CEVP®).

What is Self-Modeling Risk Management Spreadsheet?

A simplified self-modeling spreadsheet that project design teams can enter risk into and determine what the quantitative impacts are to the project estimate. This can be used for all projects but is primarily meant for projects that do not meet the threshold for a formal CRA/ CEVP®



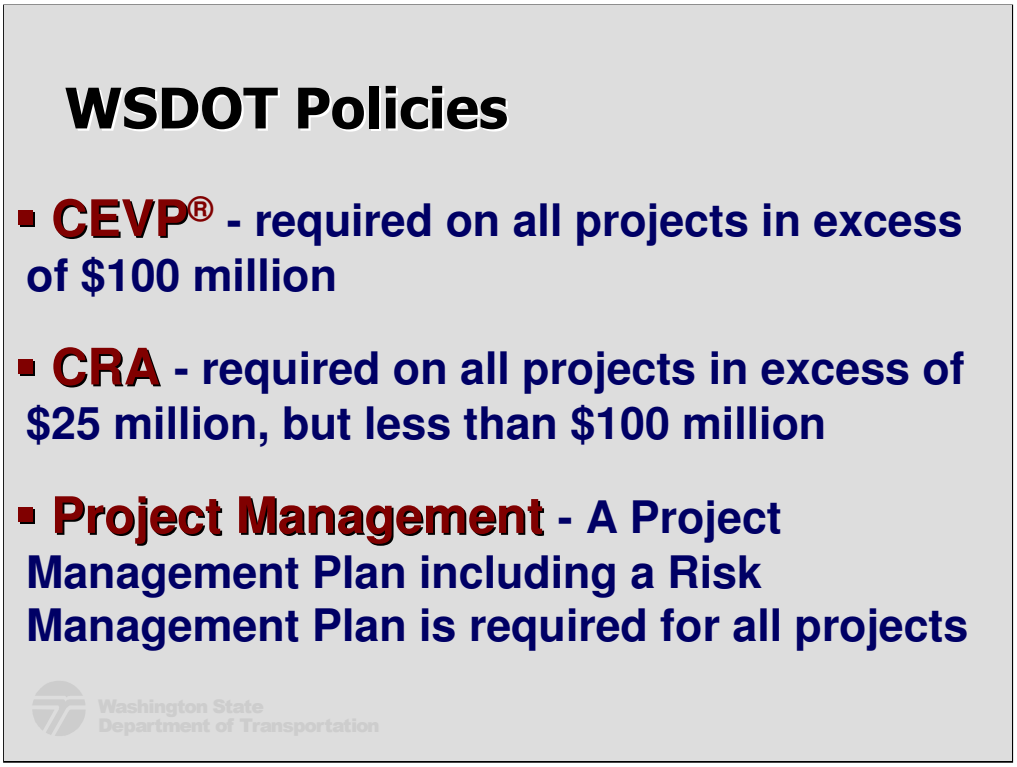
Why evaluate risk?

It is impossible to predict the future and there is unavoidable uncertainty about long-lasting construction projects. If we ignore uncertainty the results of the project evaluation will be flawed.

Construction Decisions are of necessity made within the technical and cost context of their time. The technical and cost context is dynamic so the structures we build often survive into very different times.

Source: New Generation Whole-Life Costing (Property and construction decision-making under uncertainty)

By Ian Ellingham and William Fawcett

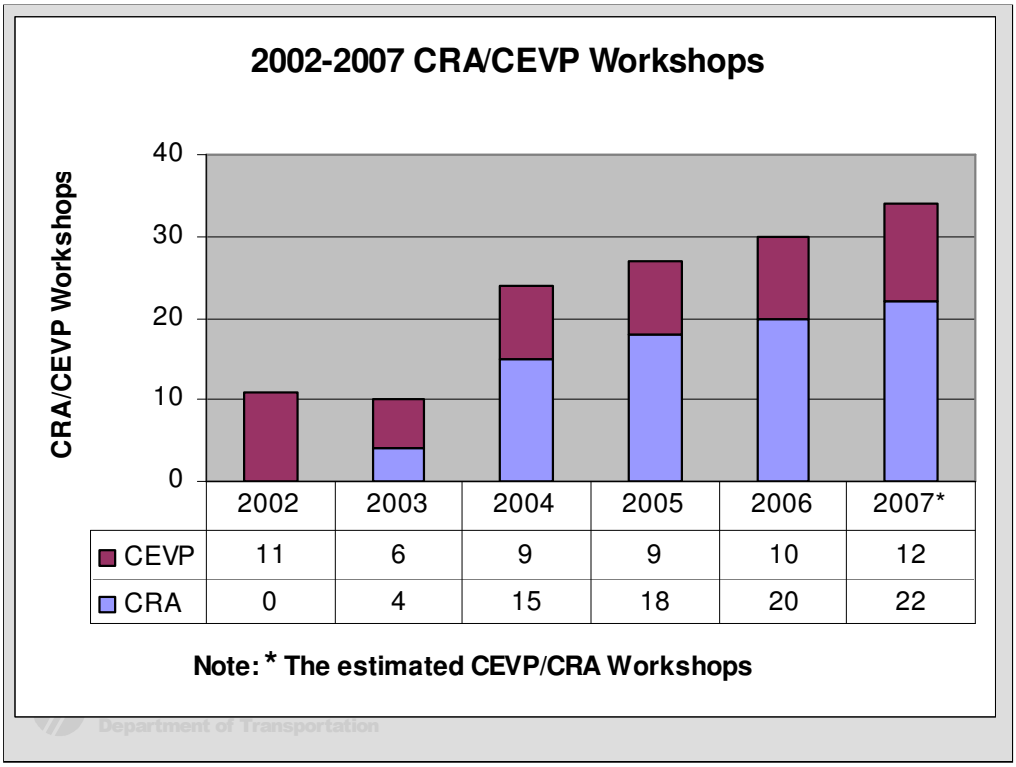


Risk management plans are a component of every project management plan. Project management plans are required for all projects. WSDOT has several tools, these tools are scalable to project size and complexity.

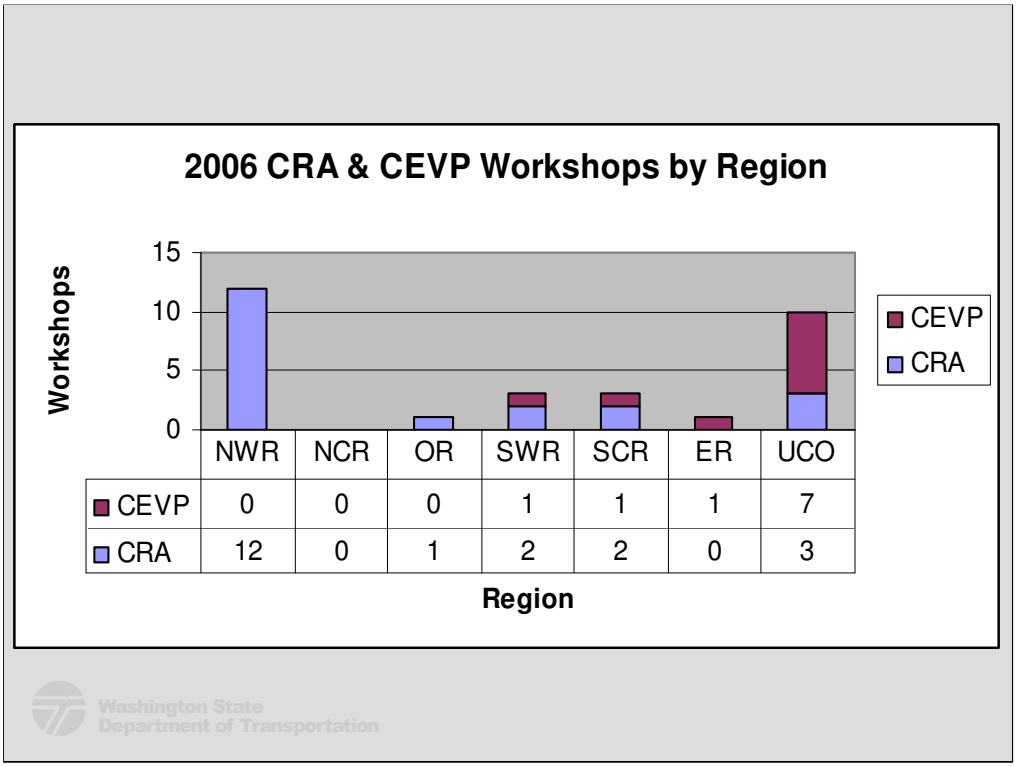
Cost Risk Assessment (CRA) is a term used to describe a broad program of risk based assessment being conducted within Washington State Department of Transportation. CRA is also a term that describes a workshop process similar but less intense than a Cost Estimate Validation Process® (CEVP). Risk managment is an integral part of the WSDOT Project Management Process.

For projects less than $25 million a project manager may still wish to conduct a workshop for the project –this is fine and it can be scaled down to meet the needs of the particular project.

For the majority of projects in WSDOT CRA/CEVP workshops are not held and there are several tools to help with these projects. In the project management online guide there is a simplified spreadsheet that allows a qualitative assessment of project risks. In addition on the CREM website there is a “Self-Modeling RMP” (an excel spreadsheet) that can be used by project teams on their own to perform simplified quantitative analyses of their project risks: http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/



Risk based estimating at WSDOT is a cutting edge program that has contributed to the improved understanding of projects and project uncertainty to a degree never enjoyed in the past.



Breakdown of workshops across the state in 2006

CEVP® Most Frequent Cost Risks

1. R/W
2. Structures
3. Environmental
4. Cost
5. Seismic Design Criteria
6. Design and/or Construction Related
7. Access
8. Stormwater
9. Traffic Control

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> R/W represented over 50% of the total project risk on one occasion.

> Stormwater represented 47% of the total project risk on one occasion.

Project teams were heavily design oriented and R/W, environmental, Seismic and other design issues were more common on the risk registers.

Opportunities, while relatively few, were oriented more toward construction and structures.

CEVP® Most Frequent Schedule Risks

1. **Environmental**
2. **Permits**
3. **R/W**
4. **Utilities**
5. **Design**

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CEVP Schedule Delay Risks by Largest Magnitude

1. Permits
2. Environmental
3. R/W
4. Structures
5. Utilities
6. Design
7. Access
8. RR

CRA Most Frequent Cost Risks

1. Environmental
2. Design Related
3. Cost
4. R/W
5. Structures
6. Stormwater
7. Seismic Design Criteria

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82% of CRAs cost risks were under $1 million

11% were between $1 million and $2 million

For cost risks there was fewer by count for CRA than for CEVP; CRAs typically are less complex and have less diverse workshop participants.

CRA Schedule delays were noticeably shorter than schedule delays for CEVPs.

Self Modeling Risk Management Plan Spreadsheet

Project Title:	Tieton River Bridge Crossings								
			Risks Estimate		Percentile	Total CN Estimate (YOE)	Percentile	Total CN Estimate (YOE)
CRA/VE Date:	August 8, 2006							
Project PIN #:		Min	-0.74 $M		10%	11.29$M	60%	12.35 $M
Last Review Date:	October 2, 2006	Max	4.13 $M		20%	11.60$M	70%	12.45 $M
Project Manager:		Median	1.48 $M		30%	11.71$M	80%	12.77 $M
Estimated Current Cost:	10.07 $M	OK	1.48 $M	Error	40%	11.92$M	90%	13.09 $M

Markups	
Mob+PE	25.00%
Tax	7.90%
CE	15.00%
Total	1.55

Functional Assignment	Risk Impact in $M	Functional Assignment	Risk Impact in $M
Environmental	0.17	Design	
Right of Way	0.13	Railroad	
Construction	0.00	Public Involvement	
Geotech	0.36		
Utility	0.00		

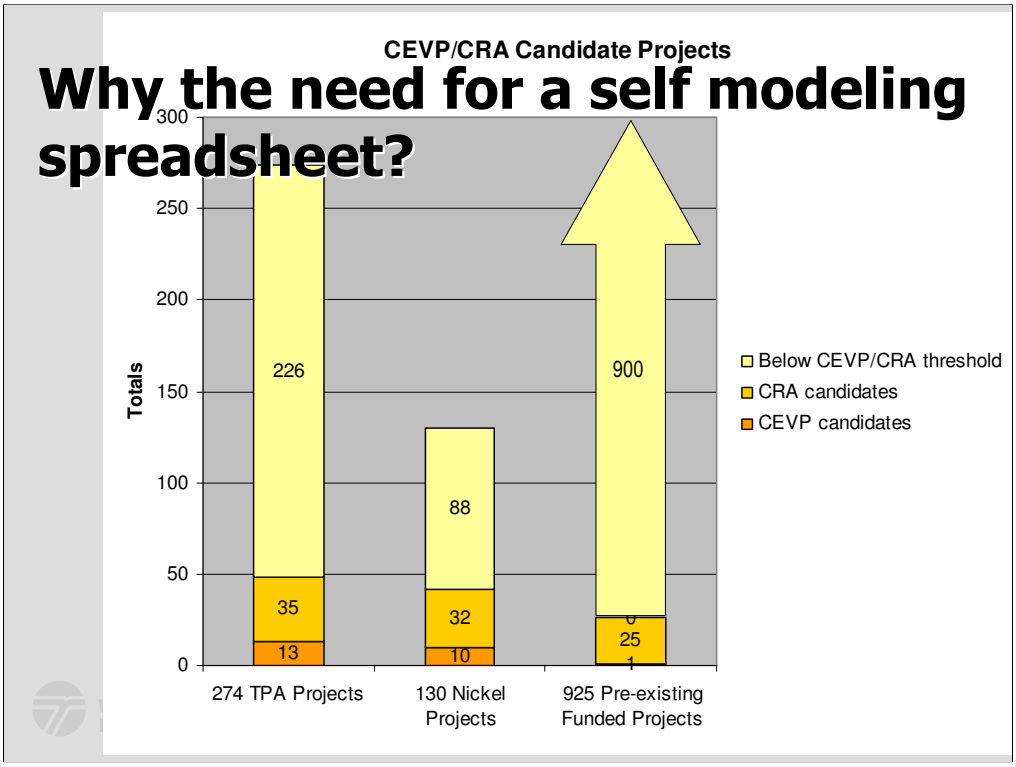
PROJECT RISK MANAGEMENT PLAN

Risk Identification								Quantitative Analysis				Qualitative Display of Max Impact			Risk Response Plan		Monitoring and Control			
Priority	Status	ID #	Date Identified / Project Phase	Functional Assignment	Summary Description Threat and/or Opportunity	Detailed Description of Risk Event (Specific, Measurable, Attributable, Relevant, Timebound)	Risk Trigger	Type	Probability (%)	Risk Impact ($M)	Expected Impact ($M)	Probability (%)	Impact	Risk Matrix (Probability of Occurrence by Max Impact)	Strategy		Risk Owner	Risk Review Dates	Date, Status and Review Comments (Do not delete prior comments, therefore providing a history)	Is Risk on Critical Path?
1	Active	E1	Aug-06 Design/PS&E	Environmental	Threat Wetland	Uncertain wetland mitigation area / costs exceed estimate	Wetland Impact	Schedule Cost	10.00% 40.00% 50.00% 10.00% 90.00%	0.40 0.30 0.00 0.05 0.00	0.17	Very Low	Very High	X	Mitigation	Partnerships with other agencies to satisfy wetland mitigation. On site or off site.	Gary Beeman/Troy Suing			NO
2	Retired	E2	Aug-06 Design/PS&E	Environmental	Threat Environmental Documents	Environmental Documents taking longer than anticipated due to outside delays	Environmental Office Status Reports	Schedule			NO RISK	NO RISK	NO RISK		Mitigation	Early coordination with the Environmental Office	Gary Beeman/Troy Suing			YES
3	Active	E3	Aug-06 Design/PS&E	Environmental	Threat Environmental Permits	Environmental Permits taking longer than anticipated due to outside delays	Environmental Office Status Reports	Cost Schedule	20.00% 80.00%	0.04 0.00	0.008	Low	Very Low	X	Mitigation	Early coordination with the Environmental Office	Gary Beeman/Troy Suing			
4	Retired	E4	Aug-06 Design/PS&E	Environmental	Threat Ecological Connectivity	May need to address ecological connectivity	Nature Conservatory, Forest Service	Schedule			NO RISK	NO RISK	NO RISK		Mitigation	Early communication with agencies to determine connectivity needs	Gary Beeman/Troy Suing			

The Self-Modeling Risk Management Spreadsheet is a simplified self-modeling tool that project design teams can enter risk into and determine what the quantitative impacts are to the project estimate.

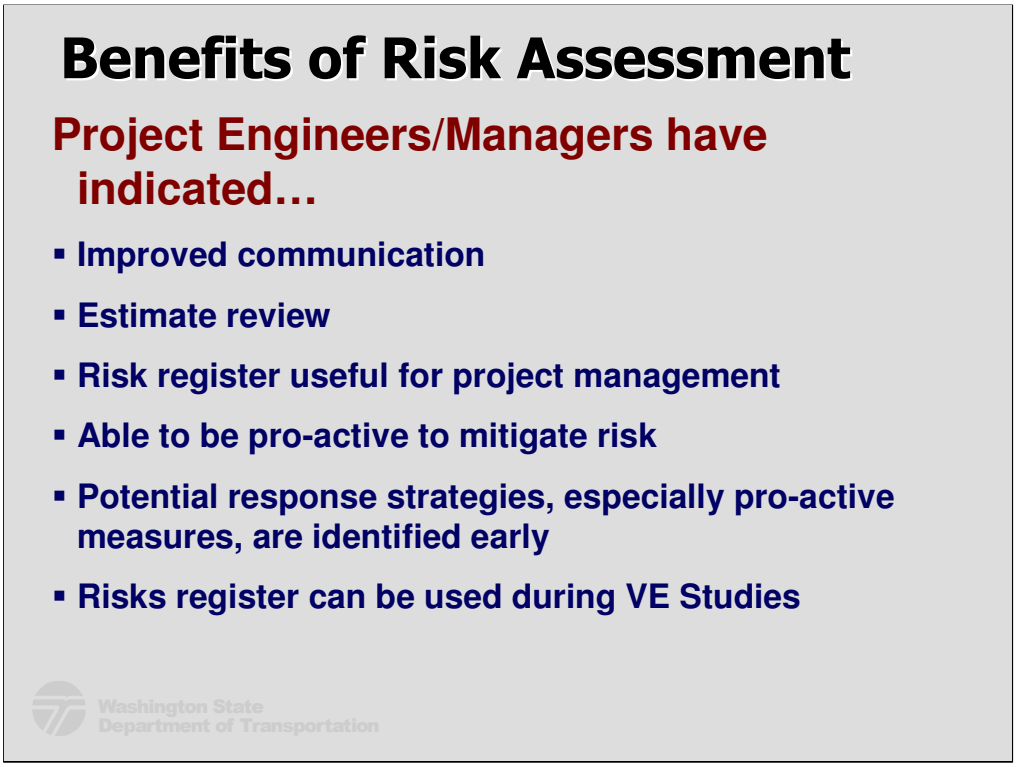
This can be used for all projects but is primarily meant for projects that do not meet the threshold for a formal CRA/ CEVP®. This tool has successfully been used by several projects. It is an effective and relatively easy way for smaller, typically less complex, projects to assess risk for their projects.

Why the need for a self modeling spreadsheet?



So as you can see from this chart, there are 226 projects from the 91/2 cent gas tax increase, 88 from the nickel gas tax increase and approximately 900 pre-existing funded projects that do not meet the threshold for requiring a CRA or CEVP.

So there is over 1200 projects that were having risks identified but not quantified, so the impacts to the estimate was unknown.



The benefits of risk based estimating, utilizing CEVP workshops include:

•Increased and improved communication, within the project team, in and among cross-functional groups, stakeholders, management, the legislature, and the public at large

•The risk ranking provided by workshop output helps the project manager know where to focus his/her team's efforts.

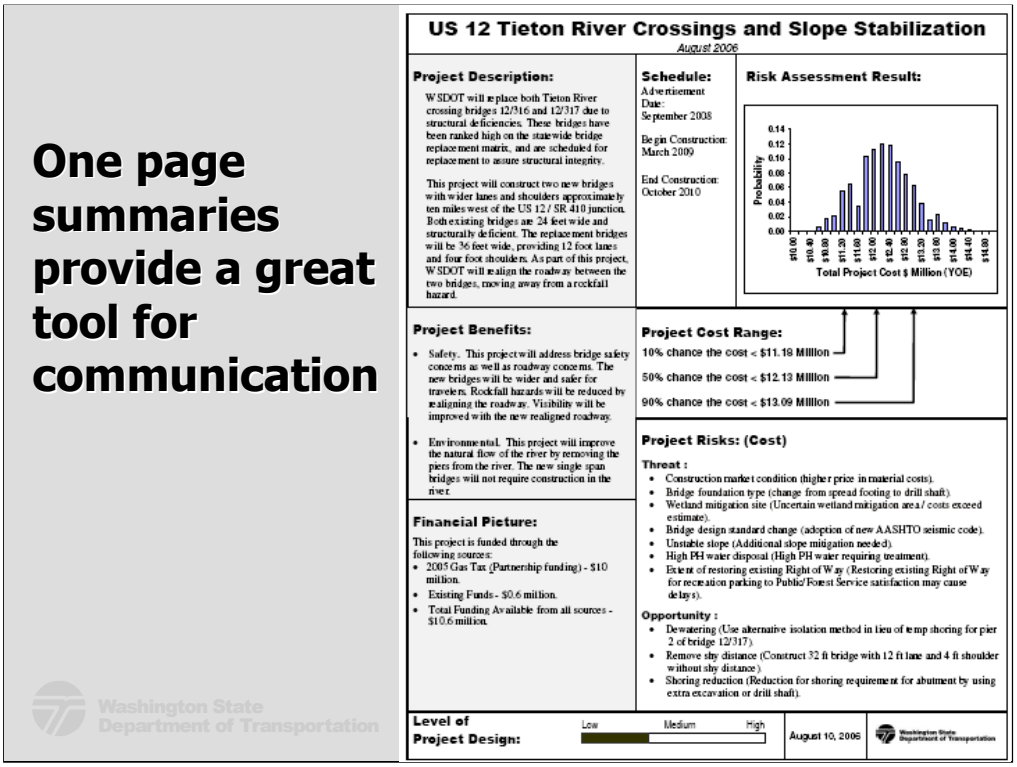
•The ability to act pro-actively on risk items and track the risk for which no preemptive action can be taken is helpful.

•It provides a running start into development of the risk management plan component of the project management work plan.

•Project teams receive ideas on potential response strategies for major risks.

•Project managers are better prepared for the unexpected.

One page summaries provide a great tool for communication



US 12 Tieton River Crossings and Slope Stabilization

August 2006

Project Description:

WSDOT will replace both Tieton River crossing bridges 12/316 and 12/317 due to structural deficiencies. These bridges have been ranked high on the statewide bridge replacement matrix, and are scheduled for replacement to assure structural integrity.

This project will construct two new bridges with wider lanes and shoulders approximately ten miles west of the US 12 / SR 410 junction. Both existing bridges are 24 feet wide and structurally deficient. The replacement bridges will be 36 feet wide, providing 12 foot lanes and four foot shoulders. As part of this project, WSDOT will realign the roadway between the two bridges, moving away from a rockfall hazard.

Schedule:

Advertisement Date: September 2008

Begin Construction: March 2009

End Construction: October 2010

Risk Assessment Result:

Project Benefits:

- Safety. This project will address bridge safety concerns as well as roadway concerns. The new bridges will be wider and safer for travelers. Rockfall hazards will be reduced by realigning the roadway. Visibility will be improved with the new realigned roadway.
- Environmental. This project will improve the natural flow of the river by removing the piers from the river. The new single span bridges will not require construction in the river.

Project Cost Range:

10% chance the cost < $11.18 Million

50% chance the cost < $12.13 Million

90% chance the cost < $13.09 Million

Financial Picture:

This project is funded through the following sources:

- 2005 Gas Tax (Partnership funding) - $10 million.
- Existing Funds - $0.6 million.
- Total Funding Available from all sources - $10.6 million.

Project Risks: (Cost)

Threat :

- Construction market condition (higher price in material costs).
- Bridge foundation type (change from spread footing to drill shaft).
- Wetland mitigation site (Uncertain wetland mitigation area / costs exceed estimate).
- Bridge design standard change (adoption of new AASHTO seismic code).
- Unstable slope (Additional slope mitigation needed).
- High PH water disposal (High PH water requiring treatment).
- Extent of restoring existing Right of Way (Restoring existing Right of Way for recreation parking to Public/Forest Service satisfaction may cause delays).

Opportunity :

- Dewatering (Use alternative isolation method in lieu of temp shoring for pier 2 of bridge 12/317).
- Remove slty distance (Construct 32 ft bridge with 12 ft lane and 4 ft shoulder without shy distance).
- Shoring reduction (Reduction for shoring requirement for abutment by using extra excavation or drill shaft).

Level of Project Design: Low — Medium — High

August 10, 2006

Washington State Department of Transportation

- Project Description
- Project Benefits
- Progress
- Cost Range
- Project Risks
- Schedule Range
- Key Financial Assumptions

Risk Assessment Next Steps

- **Develop Risk Database(s)**
  - Track common risk
  - Track response Strategies
  - Assist with performance measurements
  - Develop consistency when identifying common risks
- **Improve monitoring and quantification of results**
- **More fully develop performance measurements**

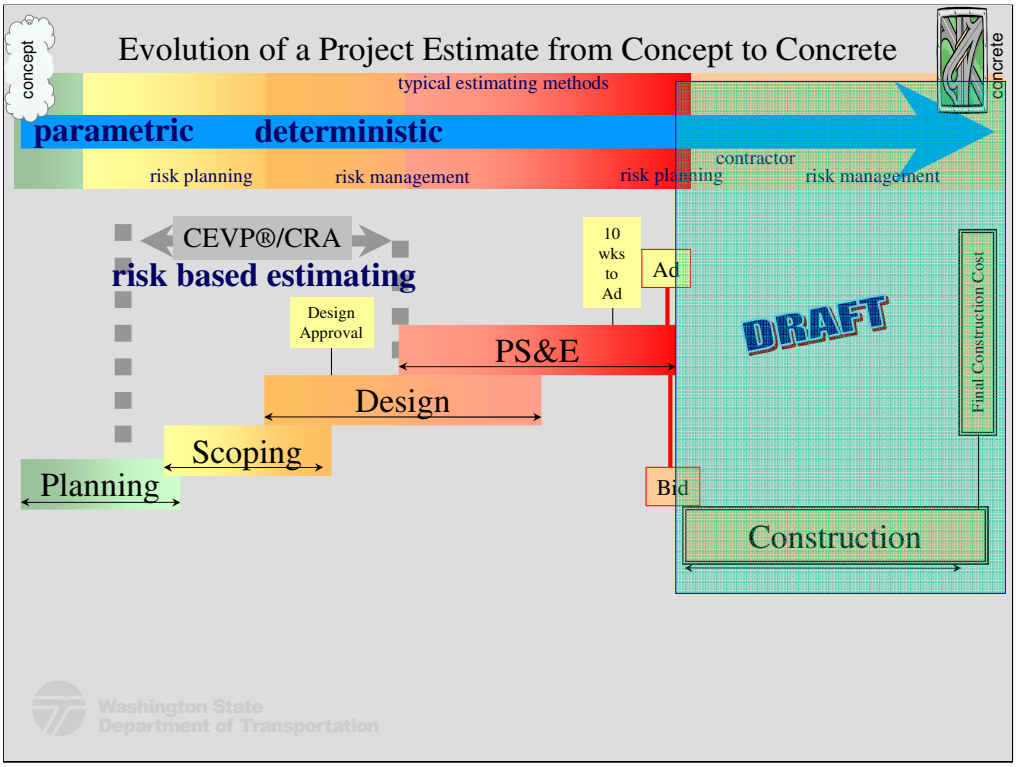
Washington State Department of Transportation

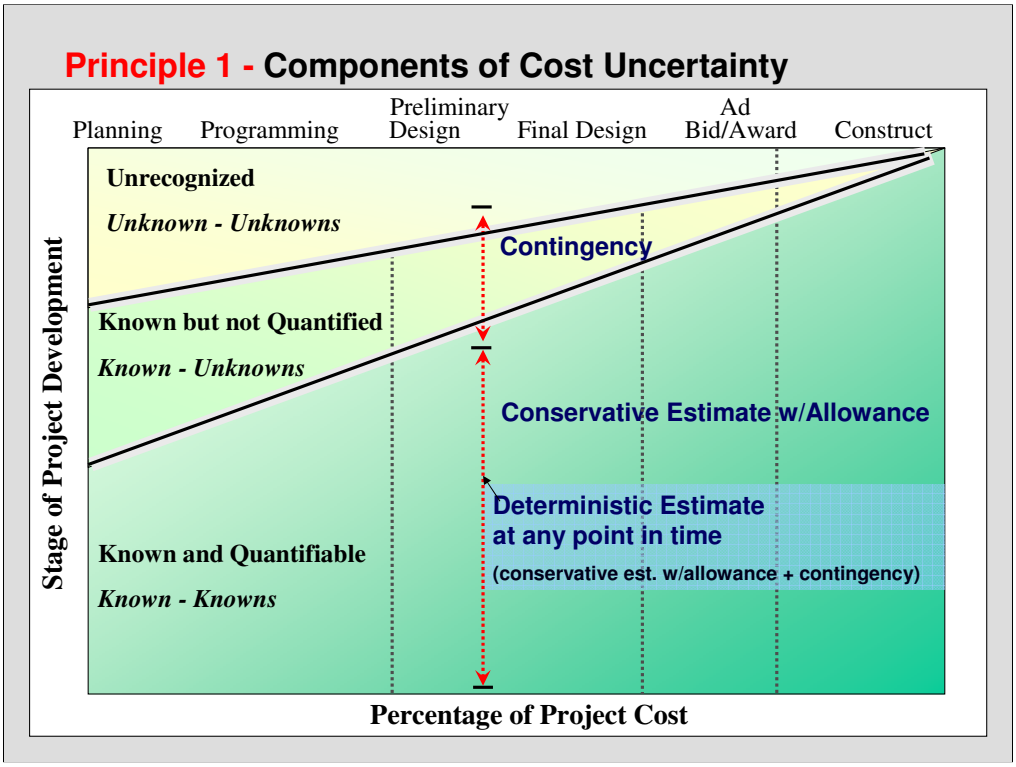
So what's next?

WSDOT's commitment to project management excellence continues. The Cost Risk Estimating Management efforts continue to expand the use of CEVP® and CRA as well as continuing to improve the process. We have begun use of combined CRA and Value Engineering workshops on selected projects. Work is being done to develop a risk database of common risks.


Questions?
Washington State
Department of Transportation

Questions?


Evolution of a Project Estimate from Concept to Concrete
concept
concrete
typical estimating methods
parametric
deterministic
risk planning
risk management
risk planning
contractor
risk management
CEVP®/CRA
risk based estimating
10 wks to Ad
Ad
Design Approval
PS&E
Design
Scoping
Planning
Bid
Construction
DRAFT
Final Construction Cost
Washington State Department of Transportation



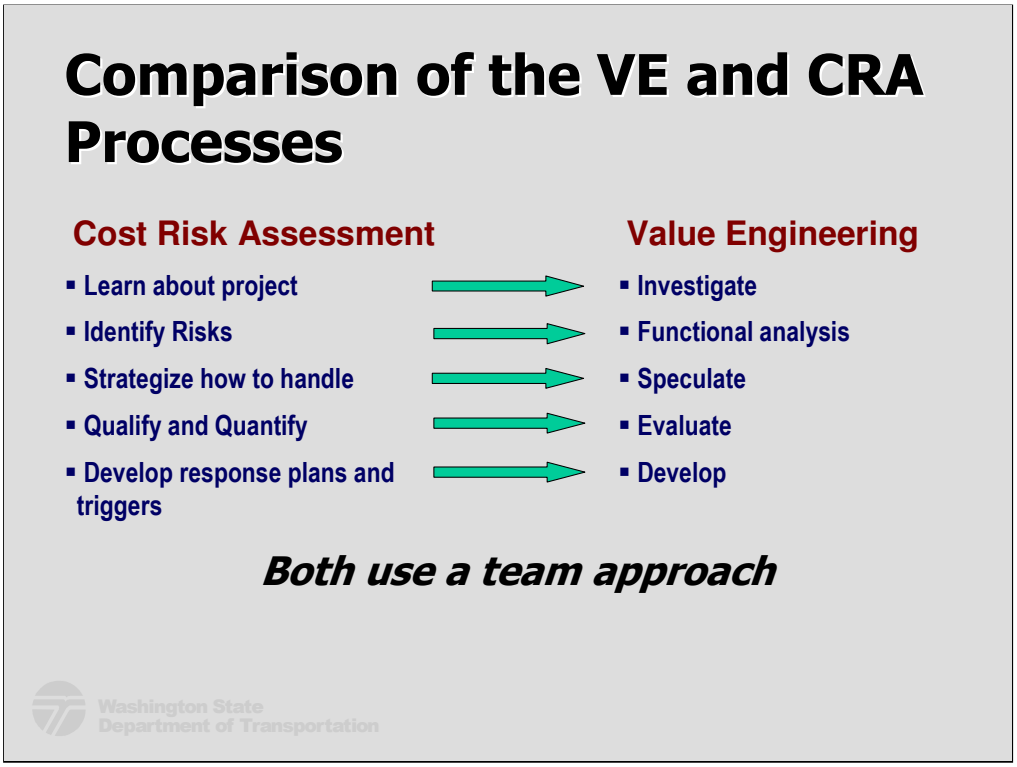
Key … recognize & capture uncertainty

Understand from where uncertainty comes and how it evolves over the period of project planning and design empowers the design team

Barriers to a successful project need to be identified and removed

“Managing in a fishbowl” is a reality,…… so manage the communication

Are there principles that we can apply??



Investigation - Review the risk register, contingencies and bid items that are set up to mitigate risk

Functional analysis - Include the secondary function of “reduce risk”

Speculation - Brainstorm ideas on how to reduce risk

Evaluation - Include a risk assessment as part of the evaluation criteria

Development - Develop recommendations that reduce risk. Include a risk assessment for VE recommendations that modify the original design